

Episodic PM_{2.5} Maintenance SIP Point Source Inventory

The PM_{2.5} Maintenance SIP requires a point source inventory for episodes and projections. Episodic inventories are used to verify that the air quality model is working properly by replicating concentrations that were measured during the corresponding episode. The modeling analysis evaluated three such episodes including January 1, 2011 through January 10, 2011, December 7, 2013 through December 19, 2013, and February 1, 2016 through February 16, 2016. The selected episode that supports this PM_{2.5} Maintenance SIP included the episode of January 1, 2011 through January 10, 2011. For further information on how the specific days were determined, refer to the Episode Selection portion of this Technical Support Document (TSD).

As with all inventories collected for this analysis, the pollutants of concern included PM₁₀, PM_{2.5}, SO₂, NO_x, VOC, CO, and NH₃ and the unit of measurement was tons per year (tpy).

Source Selection:

Industrial point sources are one of the fundamental pieces to this inventory. As indicated above the episodic days selected included January 1, 2011 through January 10, 2011. Therefore, it was determined that the 2011 triannual point source inventory would be used for episodic modeling analysis. The 2011 triannual point source inventory included all major sources, Title V sources, and any sources included in the PM₁₀ or ozone maintenance plans.

For the SIP base year inventory, UDAQ used the definition of a major source under Title V of the Clean Air Act (as specified in 40 CFR 51.1000) to define the thresholds for the reporting of actual emissions for point sources in the nonattainment areas. These thresholds are 70 tons per year or more of direct PM_{2.5} or any PM_{2.5} precursor in a serious nonattainment area for the PM_{2.5} NAAQS. For point sources located in the surrounding area however, a threshold for potential to emit annual emissions of 100 tons for any of the relevant criteria air pollutants was used. The inventory listed above was used to develop the selected episodic inventory. Emissions from sources under the above thresholds were included in the area source inventory.

Major sources contained within the prescribed modeling domain were determined according to the above definition. Emissions data for any additional sources contained in the prescribed modeling domain but located outside of Utah was obtained from the EPA National Emission Inventory (NEI) database (2014 NEI v2).

Data Collection and QA/QC

The 2011 point source emissions inventory data was collected in electronic and hard copy form in the spring of 2012. Data collected electronically was uploaded via an electronic upload program into the UDAQ TEMPO database. Summary data for hard-copy inventories were entered by hand into the database by UDAQ inventory staff.

UDAQ constructed Microsoft Excel inventory workbooks for most of the larger point sources. These workbooks provide a better interface with sources, a more thorough quality assurance/quality control (QA/QC), and allow for seamless upload to the TEMPO database. Construction of these workbooks required a very careful evaluation of the emissions calculations and their representativeness of each particular facility. After receiving completed workbooks from the sources they were individually inspected and updated to reflect any necessary changes requested by the sources before being uploaded into the TEMPO database. UDAQ utilized inventory workbooks for the majority of the defined major point sources contained in the prescribed modeling domain to collect the 2011 annual emissions inventory. Hard copy inventories were collected for the remaining sources with the following exception. For any sources where an emissions inventory was not available UDAQ used 90% of PTE to develop an emissions inventory. The electronic inventory workbooks encompass over 75% of the total calculations for Utah's major point source episodic emissions inventories thereby greatly surpassing EPA guidance requiring 10% QA/QC as the minimum criteria necessary for a SIP inventory QA/QC check. Point source emissions inventory workbooks for the majority of major sources along with hard copy submittals for the remaining sources are available in electronic format upon request.

Emissions data for any additional sources contained in the modeling domain but located outside of Utah was obtained from the EPA National Emission Inventory (NEI) database (2014 NEI v2).

The 2011 inventory was reported and compiled in terms of tons per year (tpy). Since the PM_{2.5} Maintenance SIP is designed to protect the 24-hour standard, the model (CAMx) evaluates emissions on an hourly basis. It uses a pre-processor called SMOKE in order to convert the annual inventory to a 24-hour basis (explained in further detail below).

Because the model is evaluating the buildup of PM_{2.5} concentrations over the span of multi-day episodes, an (annual) inventory worksheet was used to develop each episode day. This stands in contrast to the mobile source portion of the inventory wherein differences between weekdays and weekends (among other factors) will result in daily variations.

Condensable Particulate Emissions:

Condensable particulate matter (PM) is material that is vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form

solid or liquid PM after discharge from the stack. Note that all condensable PM, if present, is typically in the PM_{2.5} size fraction, and therefore all of it is a component of both primary PM_{2.5} and primary PM₁₀. Condensable emissions were included in the 2011 emission inventories submitted by the sources.

The SMOKE Emissions Model and Processor

The emissions processing model, SMOKE, takes the annual, county wide emissions inventory prepared by UDAQ and reformulates it for use in the air quality model. There are three aspects to this reformulation of the inventory that, in the end, produces a refined version of the inventory. These include temporal processing, spatial processing, and speciation. Temporal processing converts emissions from annual to daily and hourly values. Spatial processing locates emissions from the county to specific grid cells within the modeling domain. Speciation breaks PM and VOC emissions into their component subspecies.

The emissions processing for air quality modeling is done with sets of activity profiles based on various Source Classification Codes (SCCs) and associated cross reference files developed using source provided temporal data. This feature essentially establishes the level of detail required of the point source inventories, wherein each “source component” has with it an associated SCC. These SCCs and the cross-reference files are also created for area sources and mobile sources.

Once developed, these activity profiles serve to establish the temporal allocation of emissions within the model (e.g. 8-hour workdays), and also determine the speciation of PM and VOC emissions.